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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/788,778	02/26/2004	Jeffrey H. Hunt	14705-0002	6139
31278	7590	09/22/2005	EXAMINER	
STRADLING YOCCA CARLSON & RAUTH SUITE 1600 660 NEWPORT CENTER DRIVE P.O. BOX 7680 NEWPORT BEACH, CA 92660			YAM, STEPHEN K	
			ART UNIT	PAPER NUMBER
			2878	
DATE MAILED: 09/22/2005				

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary

Application No.

10/788,778

Applicant(s)

HUNT, JEFFREY H.

Examiner

Stephen Yam

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-25 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 February 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>0204</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Double Patenting

1. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

2. Claims 1-25 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-17 of copending Application No. 10/863,866. Although the conflicting claims are not identical, they are not patentably distinct from each other because both applications recite similar systems with a photodiode operating in Geiger mode, a first and second light source emitting first and second wavelengths respectively, with avalanching of electrons in the photodiode resulting in a photorefractive response within the photodiode, and a capture device capturing light from the photodiode.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

3. Claims 1-25 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-25 of U.S. Patent No. 6,829,072. Although the

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conflicting claims are not identical, they are not patentably distinct from each other because both the present application and the conflicting patent recite similar systems with a photodiode operating in Geiger mode, a first and second light source emitting first and second wavelengths respectively, with avalanching of electrons in the photodiode resulting in a photorefractive response within the photodiode, and a capture device capturing light from the photodiode.

Drawings

4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: 40, 42 (Fig. 1), 49 (Fig. 2), 56 (Fig. 4). Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

5. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: 58 (paragraph 0029).

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Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

6. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "40" has been used to designate both a photon (Fig. 1) and an optical system (Fig. 2) and reference character "42" has been used to designate both an electron (Fig. 1) and a first light source (Fig. 2) and reference character "56" has been used to designate both a beam splitter (Fig. 2) and light? (Fig. 4). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

7. The disclosure is objected to because of the following informalities:

The specification contains errors in the BRIEF SUMMARY section similar to the errors noted in the Claim Objections section of this action.

Appropriate correction is required.

Claim Objections

8. Claims 5, 22, 23, and 25 are objected to because of the following informalities:

In Claims 5 and 17, line 2, "photoreactive" should be replaced with "photorefractive".

In Claim 22, line 12, "photons from a first photodiode" should be replaced with "photons from the first photon source".

In Claim 23, line 2, "baising" should be replaced with "biasing".

In Claims 23 and 25, line 3, "a photodiode" lacks proper antecedent basis.

In Claim 25, line 3, "the first wavelength of light" lacks proper antecedent basis.

In Claim 25, line 5, "a first wavelength of light" lacks proper antecedent basis.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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10. Claims 1-11, 13, and 23-25 are rejected under 35 U.S.C. 102(b) as being anticipated by J.H. HUNT and R.B. HOLMES, *Observation of Optical Response of Avalanche Photodiodes at Photon-Counting Light Levels*, Journal, May 30, 1994, 3 pgs., Appl. Phys. Lett. 64 (22). (hereinafter Hunt et al.)

Regarding Claim 1, Hunt et al. teach (see Fig. 2) a device comprising a photodiode (APD) which is sensitive to a wavelength of light (see Page 2925, column 1, lines 7-31), a first source of photons (850nm diode laser) at a first wavelength (850nm) to which the photodiode is sensitive (see Fig. 1 and Page 2927, column 1, lines 10-11) incident on the photodiode, a second source of photons (1300nm diode laser) at a second wavelength (1300nm) to which the photodiode is insensitive incident on the photodiode (see Fig. 1), an electric field across the photodiode in excess of a breakdown voltage thereof (definition of Geiger mode for an avalanche photodiode- see Page 2925, column 1, lines 7-13) and configured to result in an avalanching of electrons in the photodiode when the photons from the first source strike the photodiode (see Page 2925, column 1, lines 21-25), the avalanching electrons resulting in a photorefractive response which changes the index of refraction in the photodiode (see Page 2925, lines 23-31), and a capture device (CCD camera) in optical communication with (see Fig. 2) and configured to capture light reflected from the photodiode (reflected read photons- see Fig. 1 and 4).

Regarding Claim 2, Hunt et al. teach the first source of photons transmitting an optical signal (see Fig. 4a) to the photodiode.

Regarding Claim 3, Hunt et al. teach the first wavelength less than the bandgap of the photodiode (since the write photons are absorbed- see Fig. 1).

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Regarding Claim 4, Hunt et al. teach the second wavelength greater than the bandgap of the photodiode (since the read photons are reflected- see Fig. 1).

Regarding Claim 5, Hunt et al. teach the light reflected from the photodiode is modulated by the photorefractive response of the photodiode (see Page 2925, column 1, lines 21-31).

Regarding Claim 6, Hunt et al. teach a beam combiner (intensity beam splitter) configured to combine the first and second wavelengths (see Page 2926, column 1, lines 1-2), the beam combiner positioned between the photon sources and the photodiode (see Fig. 2).

Regarding Claim 7, Hunt et al. teach at least one optical filter (Attenuator/Spatial filter, $\lambda/4$ plate) positioned between the photon sources and the photodiode (see Fig. 2).

Regarding Claim 8, Hunt et al. teach the optical filter comprises a $\lambda/4$ plate (see Fig. 2).

Regarding Claim 9, Hunt et al. teach the capture device comprises at least one device selected from the group consisting of cameras, CCD devices, imaging arrays, and photometers (see Fig. 2 and Page 2926, column 2, lines 11-19).

Regarding Claim 10, Hunt et al. teach (see Fig. 2) at least one optical component (20x telescope objective) positioned between at least one of the photon sources and the photodiode.

Regarding Claim 11, Hunt et al. teach the at least one optical component is selected from the group consisting of wavelength filters, spatial filters, shutters, light modulators, light valves, lens, lens systems, and objectives (see Fig. 2).

Regarding Claim 13, Hunt et al. teach the photodiode configured to operate in Geiger mode (See Page 2925, column 1, lines 10-13).

Regarding Claim 23, Hunt et al. teach (see Fig. 2) a method, comprising biasing a photodiode to operate in Geiger mode (see Page 2925, column 1, lines 10-13), irradiating a

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photodiode (APD) with a first wavelength (850nm) of light (from 850nm diode laser) to which the photodiode is sensitive (see Fig. 1 and Page 2927, column 1, lines 10-11), the first wavelength of light transmitting an optical signal (see Fig. 4a), irradiating the photodiode with a second wavelength (1300nm) of light (from 1300nm diode laser) to which the photodiode is insensitive (see Fig. 1), modulating (see Page 2926, column 2, lines 33-35) light reflected from a surface of the photodiode with a photorefractive reaction within the photodiode (see Page 2925, column 1, lines 21-31), and capturing (with CCD camera) the modulated reflected light (read photons- see Fig. 1 and 4).

Regarding Claim 24, Hunt et al. teach filtering the modulated reflected light (with 1000nm filter) prior to capture (see Fig. 2).

Regarding Claim 25, Hunt et al. teach (see Fig. 2) a method comprising configuring a photodiode (APD) to operate in Geiger mode (see Page 2925, column 1, lines 10-13), irradiating (see Fig. 2) the photodiode with a first wavelength of light (from 850nm diode laser) transmitting an optical signal (see Fig. 4a), initiating a photorefractive reaction (see Page 2925, column 1, lines 21-31) within the photodiode with the first wavelength of light (see Fig. 1), irradiating the photodiode with a second wavelength of light (from 1300nm diode laser) to which the photodiode is insensitive (read photon- see Fig. 1), modulating (see Page 2926, column 2, lines 33-35) light reflected from a surface of the photodiode (see Fig. 1) with the photorefractive reaction within the photodiode (see Page 2925, column 1, lines 21-31), and capturing (with CCD camera) the modulated reflected light (read photons- see Fig. 1 and 4).

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11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 12 and 14-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hunt et al. in view of Vickers US Patent No. 6,720,588.

Regarding Claim 12, 14, and 22, Hunt et al. teach the device in Claim 1, according to the appropriate paragraph above. Regarding Claims 14 and 22, Hunt et al. also teach the first source of photons transmitting/emitting an optical signal (see Fig. 4a). Regarding Claim 22, Hunt et al. teach the photodiode having a bandgap (see Fig. 1), with the photodiode configured to operate in Geiger mode (See Page 2925, column 1, lines 10-13), with first wavelength less than the bandgap of the photodiode (since the write photons are absorbed- see Fig. 1), and the second wavelength greater than the bandgap of the photodiode (since the read photons are reflected- see Fig. 1). Hunt et al. do not teach the photodiode as an InGaAsP photodiode. Vickers teaches a similar avalanche photodiode (APD) operating in Geiger mode (see Col. 2, lines 63-67), in which an electric field across the photodiode in excess of a breakdown voltage thereof is configured to result in an avalanching of electrons in the photodiode when photons strike the photodiode (see Col. 2, lines 63-67), with the photodiode composed of InGaAsP (see Col. 7, lines 23-26). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a InGaAsP photodiode as taught by Vickers, in the device of Hunt et al., since it has been held to be within the general skill of a worker in the art to select a known

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material on the basis of its suitability for the intended use as a matter of obvious design choice.

In re Leshin, 125 USPQ 416.

Regarding Claim 15, Hunt et al. teach the first wavelength less than the bandgap of the photodiode (since the write photons are absorbed- see Fig. 1).

Regarding Claim 16, Hunt et al. teach the second wavelength greater than the bandgap of the photodiode (since the read photons are reflected- see Fig. 1).

Regarding Claim 17, Hunt et al. teach the light reflected from the photodiode is modulated by the photorefractive response of the photodiode (see Page 2925, column 1, lines 21-31).

Regarding Claim 18, Hunt et al. teach a beam combiner (intensity beam splitter) configured to combine the first and second wavelengths (see Page 2926, column 1, lines 1-2), the beam combiner positioned between the photon sources and the photodiode (see Fig. 2).

Regarding Claim 19, Hunt et al. teach a polarizing plate ($\lambda/4$ plate) positioned between the photon sources and the photodiode (see Fig. 2).

Regarding Claim 20, Hunt et al. teach the capture device comprising a camera (see Fig. 2 and Page 2926, column 2, lines 11-19).

Regarding Claim 21, Hunt et al. teach the photodiode configured to operate in Geiger mode (See Page 2925, column 1, lines 10-13).

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

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Hunt US Patent No. 6,829,072, Hunt US Patent No. 6,819,476, and Hunt US Patent No. 6,549,323, teach similar devices for wavelength conversion.

Hunt, J.H.; Holmes, R.B.; McCormick, F.B. *Imaging Via Spatial Light Modulation at Photon-Counting Light Levels*, Lasers and Electro-Optics, 1996. CLEO '96, page 519, teaches a similar method of wavelength conversion using an APD in Geiger mode.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen Yam whose telephone number is (571)272-2449. The examiner can normally be reached on Monday-Friday 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on (571)272-2444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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THANH X. LUU
PATENT EXAMINER